



Applying the
**RECREATION
OPPORTUNITY
SPECTRUM
(ROS)**

in Two Canadian National Parks



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**Applying the Recreation
Opportunity Spectrum (ROS)
for
Visitor Opportunity Assessment
in Two
Canadian National Parks:
A Demonstration Project**

Report
prepared for

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Executive Summary

In the past, the assessment of opportunities for visitor use of Canadian national parks has been highly dependent on the informal knowledge and experience of field-level managers. Parks Canada, like other protected areas agencies, has invested both staff time and financial resources in searching for effective methods of assessing visitor opportunities in a more systematic fashion in existing and newly established national parks (Payne and Graham, 1993).

The advent of the Visitor Activity Management Process (VAMP) in the mid-1980s (Payne, Graham and Nilsen, 1986; Tayler, 1990) focused on both the diversity and nature of the (recreational) activities performed by visitors in national parks. However, the role of opportunity assessment in the VAMP framework was uncertain:

Some described it [VAMP] as a black box. Others felt that because opportunity assessment was not clearly defined and operationalized, VAMP would do nothing more than reinforce the status quo. A few expressed the opinion that the framework had no capability to review future potentials for a park. (Graham, 1990, 286)

Graham went on to say that other visitor management frameworks, especially the Recreation Opportunity Spectrum (ROS), "... offer possibilities to define and operationalize opportunity assessment within VAMP" (Graham, 1990).

VAMP is an activity-based management approach that has two limitations: an activity focus and an a-spatial nature.

A framework is required that augments the strengths of VAMP within a spatial context, especially its detailed examination of activities. This demonstration project examines one such framework, the Recreation Opportunity Spectrum (ROS), to see how it might assist national park managers in assessing and managing visitor opportunities. Two national parks were selected as case studies to demonstrate the ROS framework: Pukaskwa National Park, on the north shore of Lake Superior and representative of the great boreal forest natural region; and Yoho National Park, one of four mountain parks along the Alberta/British Columbia border that form a World Heritage Site.

The ROS offers managers a framework that focuses on the settings in which recreation occurs, and links these settings to activities and experiences. By firmly linking activities with the settings they require, the

ROS connects those activities to areas and sites in ways not possible through an activity-based framework.

The ROS framework incorporates unique features that overcome deficiencies associated with other park visitor and management models. The ROS framework:

- links settings and activities;
- integrates visitor management with "traditional" natural resource management processes;
- works at the regional or area scale; and
- incorporates some of the ideas on which ecosystem management is based.

On a conceptual level, the ROS framework may help manage national parks such as Pukaskwa and Yoho.

Implementing the ROS framework in a national park context depends on the availability of specific information. In the case studies presented here, a large portion of the information necessary to develop the physical and managerial setting maps was readily available. Much of the information concerning human modifications in and around the two parks has been captured digitally by the parks or by provincial governments. Acquiring information and data to build the social setting map, however, was a problem. In the Pukaskwa pilot project, the decision to use backcountry permits as data for the social setting was made reluctantly. The use of such data reflects the reality, common to all Canadian national parks, that information about visitors is neither statistical nor geocoded. The small amount of reliable and accurate data needed for the social setting map inhibits the effectiveness of the ROS framework in a national park context.

In these projects, Geographical Information Systems (GIS) and computer mapping technologies were important tools in manipulating information and presenting the results in mapped form.

The results of the pilot projects provide park managers with a set of opportunity areas, ranging from frontcountry to wilderness. These opportunity areas are relevant for the summer season when the park is fully operational and visitation is at its peak. Opportunities for visitors in the winter, for example, would be affected by reduced access, by management actions, and by influences from outside the park's boundaries. Information about such seasonal variation should be included in a complete visitor opportunity assessment.

The opportunity areas should be realigned with the topography of the national parks. In the pilots, no attempt was made to use ridge lines, viewsheds, or soundsheds as refinements for opportunity area delimitation.

Determining visitor opportunities for a national park enables management to use opportunity areas, in conjunction with ecosystem information, as key factors in decision making. Facility, infrastructure, and service decisions can be made with awareness of effects on visitor opportunities; decisions made by other agencies or partners outside national park boundaries can be examined for their effects on visitor opportunities within the national park.

Despite several problems in its application, the ROS framework gives park managers a tool that will help achieve general, as well as specific, national park goals. The next step is to combine the ROS opportunity class map with other forms of data to demonstrate how natural and social science data, information, and knowledge can be integrated to support decision making in Canadian national parks.

1 Background

1.1 Problem Statement

This report addresses the problem of visitor opportunity assessment in national parks. The problem of visitor opportunity assessment comprises a number of issues concerning visitor management that Parks Canada has been addressing. These pilot projects were initiated to consider the appropriateness of services to, and facilities for, visitors in a variety of national parks with aging infrastructures, diminishing financial resources, and increasing stress on ecosystems from human use. Work to date has resulted in two regional workshops, a Feasibility Report (1993), the development of the Risk Control Spectrum, and the Spectrum of Appropriate National Park Opportunities matrices. While much of this work was inspired by the Recreation Opportunity Spectrum (ROS) framework, the emphasis has been on defining the content of the spectrum rather than on looking at the steps in the ROS methodology to arrive at a classification. Therefore, the key to advancing this work is to apply the methodology to the problem of visitor opportunity assessment in a Canadian national park.

Pukaskwa and Yoho National parks were selected as case studies to demonstrate the ROS framework.

Pukaskwa National Park, established in 1983, occupies a representative area of the great boreal forest on the north shore of Lake Superior. When it was established, Pukaskwa National Park dominated a rugged, little-used portion of the Lake Superior shore and hinterland. In recent years, however, mining exploration, spurred on by the discovery of gold in the Hemlo area north of the park, and an expansion of logging activity, in the two adjacent Forest Management Agreement areas, have disrupted Pukaskwa's isolation from human activities. Within its boundaries, however, Pukaskwa National Park retains a predominantly backcountry atmosphere.

Pukaskwa is one of the lesser known national parks in Canada, a fact evidenced by the Park's low level of visitation.

Yoho National Park, established in 1886, occupies an area of high mountains and mountain valleys on the Alberta/British Columbia border adjacent to Banff National Park (on the north and northeast), and Catena National Park (on the southeast). Yoho is one of the "Four Mountain Parks" that constitutes a World Heritage Site and one of the largest areas of wild land remaining in North America. The geologically significant

"Burgess Shale" deposits are protected and interpreted for visitors at Yoho National Park.

The mountain valleys in the national park are heavily used. A transcontinental rail line runs through the park along the Kicking Horse River; the Trans-Canada Highway follows the same route. The valleys of the Yoho River, Emerald River, and Cataract Brook provide access for visitors to alpine sections of the park.

On its western and southern sides, Yoho abuts British Columbia Crown lands, which are managed for multiple use by the B.C. Ministry of Forests.

1.2 Purpose of this Project

This demonstration project has three related purposes:

- to provide an inventory of existing and potential recreation opportunities that can be integrated with natural and cultural resource management information for ecosystem management;
- to determine how the ROS methodology can be adapted to the Parks Canada policy context; and
- to identify refinements to the Spectrum of Appropriate Park Opportunities.

1.3 Opportunity Assessment

In the past, the assessment of opportunities for visitor use of Canadian national parks has been highly dependent on the informal knowledge and experience of field-level managers. Parks Canada, like other protected areas agencies, has invested both staff time and financial resources in searching for effective methods of assessing visitor opportunities in a more systematic fashion in new and existing national parks (Payne and Graham, 1993).

The advent of the Visitor Activity Management Process (VAMP) in the mid-1980s (Payne, Graham and Nilsen, 1986; Tayler, 1990) focused on both the diversity and the nature of the recreational activities performed by visitors in national parks. The role of opportunity assessment in the VAMP framework, however, was uncertain:

Some described it [VAMP] as a black box. Others felt that because opportunity assessment was not clearly defined and operationalized, VAMP would do nothing more than reinforce the status quo. A few expressed the opinion that the framework had no capability to review future

potentials for a park. (Graham, 1990, 286)

Graham went on to say that other visitor management frameworks, especially the Recreation Opportunity Spectrum, " ... offer possibilities to define and operationalize opportunity assessment within VAMP" (Graham, 1990, 286).

Subsequent refinement of the process (Parks Canada, 1995) brought the full weight of national parks policy to bear on decisions concerning the appropriateness of visitor activities. The introduction of VAMP as a management process for national parks has been both well-received and well-reviewed for its contribution toward achieving the mandate for national parks (Reynolds, 1990; Ashley Consulting, 1993).

Although VAMP has been useful to Parks Canada, it is an activity-based management approach, with two limitations: an activity focus and an a-spatial nature.

VAMP's activity focus is a weakness in that the recreation activities selected by visitors are not constant over time. For example, cycling, an activity that grew in popularity throughout the 1980s, changed to include bike-touring along national park roads, and mountain biking, with its off-road, backcountry orientation. Because the differences between the two types of cycling are significant, park staff must manage them separately.

The second limitation, VAMP's a-spatial nature, has immediate management implications. Knowing both the settings opportunities for activities and the actual use of national park settings for those activities gives managers an opportunity to manipulate settings for those activities to achieve park goals. The fact that VAMP lacks an explicit spatial context means that the assessment and management of visitor activities is done without an understanding of the implications and impacts of these activities within national parks.

Both limitations are understood among Parks Canada staff. Nepsted and Nilsen (1993) compared the importance of approaching the understanding of visitor opportunities and activities as a human/environment relationship. Others, such as Carlisle, Hutchinson and Schryver, (1992) and Hutchinson and Schryver (1992), used geographical information systems (GIS) to illustrate the conflicts between visitor use and natural area protection. The most recent *State of the Parks Report* (1995) indicates that the main threat to ecological integrity in Canadian national parks comes from facilities for, and visitation by, visitors. In the U.S. National Parks Service, similar concerns about managing visitor opportunities and use has lead the agency to adopt a formalized process for collecting and using visitor information in national park decision making (Machlis, 1996).

Policy direction also exists to reinforce the desirability of achieving a better integration of Parks Canada's conflicting goals into its management processes for national parks. Similar to other protected areas agencies (e.g., U.S. Forest Service, 1994), Parks Canada has proposed, in its revised policy statement (1994), that only ecosystem management will ensure that natural settings are protected while remaining available for use by visitors.

A framework is required that combines the strengths of VAMP (especially its detailed examination of activities) with a spatial context. This demonstration project examines one such framework, the Recreation Opportunity Spectrum, to determine how it can assist national park managers in assessing and managing visitor opportunities.

1.4 Recreation Opportunity Spectrum (ROS)

The Recreation Opportunity Spectrum was developed by the U.S. Forest Service as a tool for:

- managing recreation and tourism on National Forest lands; and
- integrating recreation and tourism with other (non-recreational) land uses.

Specifically, ROS can assist managers by providing guidelines for:

- taking inventory of the supply of recreation opportunities;
- analyzing the effects of other activities on the supply of recreation activities;
- analyzing the consequences of management decisions on recreation opportunities;
- linking user demand with available opportunities;
- identifying complementary roles for regional recreation suppliers; and
- establishing standards and guidelines for recreation settings.

The ROS framework represents a response to the problems faced by land managers in applying the carrying capacity concept to problems of recreation and tourism provision. Although carrying capacity is an attractive concept, it has proven to be notoriously difficult to employ as a management tool. While the ROS addresses ecological carrying capacity (i.e., the idea that the number of people in an area or at a site is directly related to the loss of ecological integrity and biological diversity), ROS is especially effective in its treatment of social carrying capacity (i.e., the idea

that the number and type of people in an area or at a site is directly related to its perceived recreational quality).

The ROS framework is based on the idea of a recreation opportunity. A recreation opportunity is a combination of three components of people's recreational involvements: activities, settings, and experiences. A recreation opportunity, therefore, is an activity that yields certain experiences for participants in a specific setting.

To appreciate the usefulness of the ROS framework, consider an activity such as cross-country skiing. Skiing on an urban golf course with one's children is likely to result in experiences that are family- and exercise-oriented. Skiing in the backcountry of Pukaskwa National Park with peers is likely to result in a different set of experiences. Therefore, the same activity, cross-country skiing, can be associated with different experiences in different settings.

Recreation opportunities can be described (Driver and Brown, 1983) as the result of combinations of land and natural resources, personnel resources, and financial (capital and operating) resources created by an agency such as Parks Canada. The supply of recreation opportunities is affected by social, economic, and political factors; it occurs within, and is limited by, the legislative and policy culture of the agency.

The ROS framework offers managers a tool that links settings to activities and experiences. Since national park managers must be concerned with managing settings, the potential usefulness of the ROS is evident. By firmly linking activities with the settings they require, the ROS connects those activities to areas and sites in ways not possible by an activity-based framework.

The ROS framework focuses on three items concerning recreation opportunities (see Figure 1):

- supply,
- demand, and
- diversity.



Figure 1: Link Between User Desires and Opportunities Provided by Managers (adapted from Clark and Stankey, 1990)

Supply

Supply is defined as the type and number of opportunities that can be offered by an agency, based on the nature of the area under consideration. Supply is more than merely the potential and constraints of the natural environment. Supply is affected by human modifications to the natural environment. The original (Clark and Stankey, 1978) version of the ROS divided land areas:

1. wilderness,
2. semi-primitive non-motorized,
3. semi-primitive motorized,
4. roaded natural,
5. rural, and
6. urban.

These opportunity areas can only support specific kinds of recreation activities and experiences owing to certain physical (e.g., size), social (e.g., encounters with other people), and managerial (e.g., legally designated wilderness area) characteristics. In the examples cited, the ROS class would likely be wilderness, in which one could hike and experience solitude. However, few other people and no motorized vehicles would be encountered.

The application of the ROS described in this report is based on the issue of supply.

Demand

Demand is defined as the type and number of opportunities people want. Determining demand can be difficult.

Demand for opportunities is indicated by how people use existing opportunities. Surveys and other social science research techniques may be required to determine what kind of opportunities people would like to have in a park. Information on demand and how people use national park settings, or on what opportunities they would like to have access to, is not readily available in Canadian national parks.¹

Diversity

The diversity element recognizes that people who come to parks differ in their interest in activities, expectations, experiences, and preferences of settings. Diversity — in ecological conditions — is a characteristic of the natural environment. The ROS framework acknowledges these different aspects of diversity and uses them to assess recreation opportunities.

¹ See Payne (1997).

The institutional roots of the ROS framework have caused some national park managers to question its usefulness in a parks context. Canadian national parks do not exhibit the wide range of recreational and non-recreational activities typically found and managed on U.S. national forest lands. However, the ROS is the main planning and management tool applied by the U.S. Forest Service to designated wilderness areas under its jurisdiction. In such areas, the restrictions placed on human activities to protect natural processes are just as comprehensive as they are in national parks.

Parks Canada itself has been interested in recreation management strategies similar to the ROS for several years. In the late 1980s, Pukaskwa National Park developed a "backcountry opportunity spectrum" based on the ROS. The Four Mountain Parks planning exercise of the early 1980s used a similar approach to the backcountry areas of the park complex (Parks Canada, 1986). While these initiatives exhibit qualities similar to those of the ROS, they have constituted only partial applications of the framework, based on existing park zoning.

The revised policies for Canadian national parks reinforce some of these initiatives. Through VAMP and its derivatives, such as the Appropriate Activity Assessment Process and the Visitor Risk Management Process, Parks Canada has the ability to examine the activity component of recreation opportunities. Through park management plans, conservation plans, and ecosystem management plans, Parks Canada has the ability and the experience to manage settings. The experiences reported by visitors who use national park opportunities will form an important part of Parks Canada's business planning initiative.

The application of the ROS framework represents the first time that the ROS has been applied in a comprehensive fashion (i.e., using available data and information to build the four ROS maps) in Canadian national parks to assess visitor opportunities.

2 Assessing Visitor Opportunities in Two National Parks

2.1 Methodology

2.1.1 Data and Information

Data and information for Pukaskwa National Park were gathered from:

- Revised *Pukaskwa National Park: Management Plan* (Parks Canada, 1996). This information has been digitized.
- The digital database for the park and surrounding area containing information on roads, trails, water courses, lakes, settlements, and the park boundary.
- Discussions with park staff (notably Dan Couchie, a warden and ecosystem management specialist). These discussions provided information on management actions to control access along the road coming into the park from the north, access and use of the park from water craft on Lake Superior, and use of the coastal hiking trail.

Discussions with Dan Couchie lead to a general definition of the "Pukaskwa National Park region". The area of the "Greater Pukaskwa Ecosystem", as suggested by Sibicki (1995), was rejected as being too large for this demonstration project. For project purposes, the Pukaskwa region includes the national park itself and all territory outside park boundaries, but inside the Highway #17 corridor from Wawa to Marathon. This regional context for Pukaskwa National Park recognizes that the park environment is affected by regulations and activities outside park boundaries.

Data and information for Yoho National Park were gathered from:

- *Yoho National Park Management Plan* (Parks Canada, 1988). This information has been digitized.
- The digital database for the park containing information on roads, trails, water courses, lakes, settlements, and the park boundary.

- Discussions with park staff (notably Derek Petersen, an ecosystem specialist) provided information on management actions to control access along the Ottertail River, Amiskwi River, and the Lake O'Hara area. Information on recreational activities in the Blaeberry River valley on lands managed by the B.C. Ministry of Forests was provided by park staff.
- Jon Wilsgard, Recreation Officer for the Golden District of the B.C. Ministry of Forests, who provided information concerning the agency's ROS-based land classification system for managing recreation on B.C. Crown land.
- The *Atlas of the Central Rockies Ecosystem* (White *et al.*, 1995), that provided information that enabled encounter norms along roads and trails in the Yoho Region to be estimated.

Discussions with Derek Petersen led to a general definition of the area that constitutes the "Yoho Region". For the purposes of this demonstration project, the Yoho Region includes the national park itself, the eastern part of the Blaeberry River valley adjacent to the park on the west, the lands along the Beaverfoot River southwest of the park and the Moose Creek valley on the south, and adjacent portions of Kootenay and Banff National Parks on the north and east. This regional context for Yoho National Park recognizes that the park environment is affected by regulations and activities outside park boundaries.

2.1.2 Analysis

The ROS framework relies heavily on its setting orientation for assessment of the supply of recreation opportunities. Mapping, therefore, forms a large component of opportunity assessment under the ROS.² Four maps are developed in the ROS framework:

- physical setting map,
- social setting map,
- managerial setting map, and
- ROS class map.

² An Australian firm, Digital Land Systems Research in Melbourne, has developed a ROS module to run with its GIS software, S-IGIS; the firm's World Wide Web address is URL <http://www.dlsr.com.au>. Other GIS software can also be used to good effect.

Physical setting map

Determining the physical setting component requires the mapping of two factors, remoteness and human modifications, and the application of a third factor, size, as a constraint. Remoteness is determined by distance from roads: the greater the distance from roads, the more remote the area. Roads can be mapped, and distances from those roads measured. Human modifications to the natural environment include such features as hydro-electrical power lines, railways, dams, logged areas, trails, lodges, and settlements. All features that are relevant to a specific area can be mapped. Typically, human modifications are concentrated in specific areas.

Size is a constraint at the wilderness end of the spectrum of opportunities: if an area that is relatively remote and substantially unmodified is less than 5,000 ha, it should not be considered capable of supporting wilderness activities or experiences. Therefore, depending on the area in question, its human modifications and size, a broad spectrum of opportunities (according to physical factors), can be identified.

Social setting map

The social setting mapping effort describes the density of people likely to be found in different areas. A crucial aspect of this mapping exercise is the information on users to be mapped. If there is no information, or it is of poor quality, the assessment of opportunities will be compromised. The social setting map describes the likelihood of meeting other people in different park areas. Areas based on *encounter norms* are mapped, with the lowest likelihood of encountering others found at the wilderness end of the spectrum, and the highest likelihood at the urban end.

Managerial setting map

The managerial setting map illustrates the rules that permit and guide behaviour in different areas. In a national park, the park's zoning would be the key indication of managerial presence. Other, more tangible evidence would be signage directing or advising visitors about conditions. Outside park areas (in Ontario), the managerial presence might be such designations as Forest Management Agreement areas or lands belonging to aboriginal people. In each case, some recreational activities are permitted while others are not. Of the three maps, the managerial setting is the easiest to map, as such information is readily available.

ROS class map

The ROS class map describes, in ROS terms, recreation opportunities that are available in the mapped area. It is developed by overlaying the physical, social, and managerial setting maps, and by examining conflicting areas among the three maps. Reconciling the conflicts depends on the researcher's/planner's understanding of local conditions. In an area that has been, and continues to be, modified by human activity, but is otherwise lightly used, the physical setting will drive the final ROS class decisions. In an area that is slightly modified, but heavily used by people for recreation, the social setting map will be the determining point of view. In a national park, where the full weight of legislation and policy favouring ecological integrity is applied, the managerial setting may outweigh the other two components.

The final ROS class map is the basis for the assessment and description of recreation opportunities in the mapped area.

2.2 Opportunity Assessment in the Pukaskwa National Park Region

2.2.1 The Physical Setting

The physical setting of the Pukaskwa region is presented in Map 1. Three elements combine to produce the physical setting: remoteness, evidence of humans, and size. When applied in the ROS framework, these elements form the basis for classifying the Pukaskwa regional landscape into opportunity areas.³

Existing (digitized) data and information provide the primary basis for map development. ROS criteria concerning sizes of opportunity areas, were generally followed.

The concentration of human modifications of the natural environment (roads, bridges, railways, buildings, parking lots, and noise) at Wawa, White River, and Marathon puts areas with a 5 km radius of those settlements into a *frontcountry service* opportunity class. The same frontcountry service designation is applied around the administrative complex for Pukaskwa National Park, found near Hattie Cove. The more linear modifications associated with the presence of, and the sounds from, Highway #17 are responsible for a 3 km *frontcountry modified*

³ Although the original ROS framework identifies "urban" and "rural" opportunity areas, those designations give way to a "frontcountry" class, more appropriate for most national parks. The frontcountry class is further subdivided where necessary.

designation (on each side) throughout the length the highway, along the edge of the Pukaskwa region. Finally, another 3 km buffer, designated *frontcountry natural*, where human modification is minor but where the sights and sounds of human activity are still present, separates frontcountry from backcountry.

All frontcountry opportunity areas under the physical setting mapping exhibit evidence of humans, through modifications of the natural landscape, through the sights and sounds of such modification, or both. The subdivisions of frontcountry represent an increased degree of remoteness from frontcountry service through to frontcountry natural.

At Pukaskwa National Park, the most accessible areas of the park, including Hattie Cove and the section of the coastal hiking trail down to the White River Bridge, are designated as frontcountry opportunity areas.

Backcountry opportunity areas share characteristics of minor human modification, relative remoteness, and large size.

A *backcountry high-access* opportunity class is delimited by a 1 km buffer around roads that can be used by motor vehicles. The network of forest access roads that extend south and west from the Highway #17 corridor are designated as backcountry high-access. Since these roads are primary and secondary forest access roads, they are likely to remain in the Pukaskwa region. So, too, is the hydro-electric transmission corridor that passes through the northern part of the national park. The corridor is designated backcountry high-access.⁴

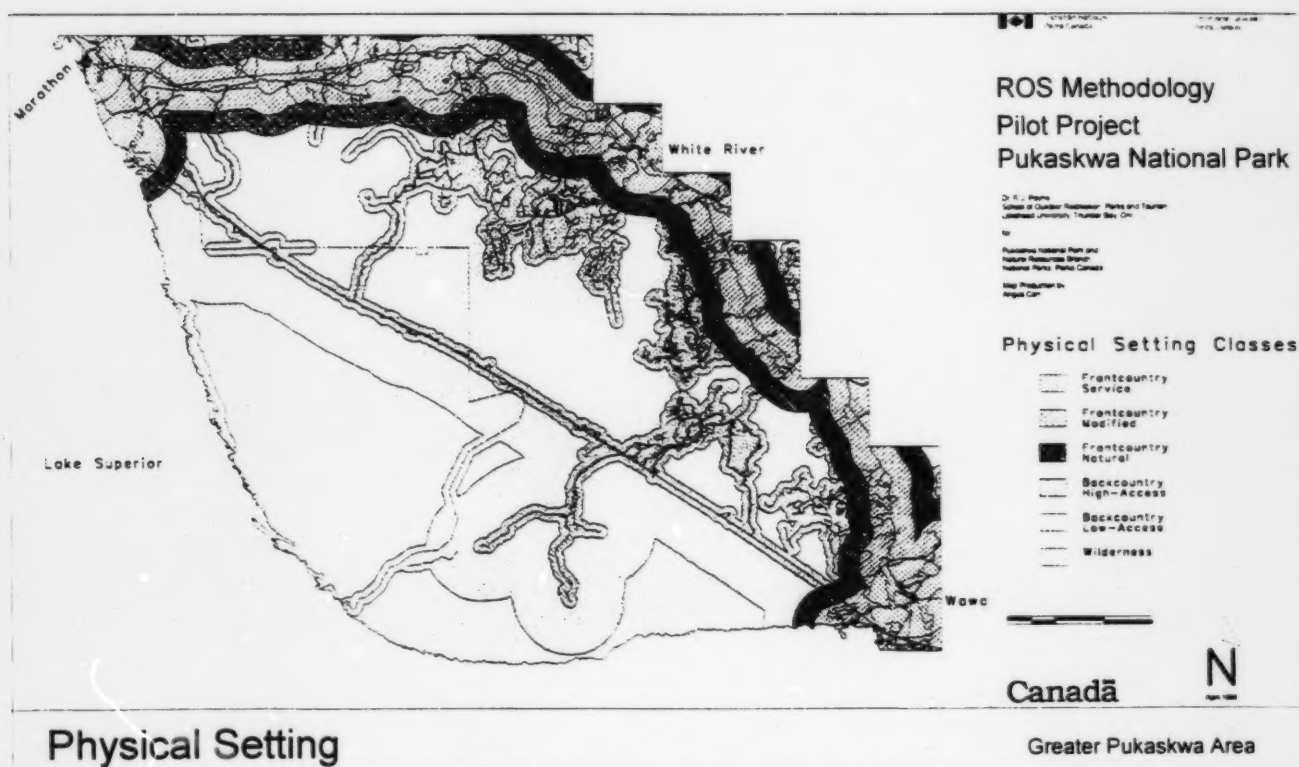
As Map 1 shows, this opportunity class and the roads on which it is based connect with the transmission corridor in the northern part of the park and extend into previously remote areas directly to the east of the park.

This opportunity class acts as a buffer to frontcountry areas, with remoteness as the key criterion.

A second backcountry opportunity designation, *backcountry low-access*, surrounds all backcountry-high access areas with an 8 km buffer on each side. These areas are more remote, offer settings and experiences closer to the wilderness end of the spectrum, and are at least one day's walk from backcountry high-access areas. On Map 1, this opportunity class includes a substantial portion of the Pukaskwa region.

⁴ The impact of the hydro-electric transmission corridor as a human modification should not be underestimated; the path of the corridor can be seen clearly in a photograph taken from the space shuttle. Visit the World Wide Web site at URL <http://nancy.lakeheadu.ca/apcar/sts/mennu.html>

Finally, areas designated as *wilderness* opportunity class account for the remainder of the Pukaskwa region. The largest of these opportunity areas is found in the south-central area of the national park; a smaller area is found along the Lake Superior shore east of Pukaskwa National Park. These areas are the least modified by human activity and the most remote. They are also larger than the 5,000 ha minimum necessary for inclusion in the backcountry opportunity class.



Map 1: The Physical Setting (Pukaskwa)

2.2.2 *The Social Setting*

Map 2 presents the social setting mapping for the Pukaskwa region. The opportunity classes under social setting reflect the likelihood of meeting other people while pursuing recreation opportunities.

The information required to establish the daily encounter norm ranges that are necessary to map the social setting effectively is not readily available for the Pukaskwa region. Similarly, information on vehicular travel on highways and forest access roads is also unavailable. However, information reported for the coastal hiking trail was collected from permits and is generally reliable. Information on visitors in the other areas of the region, both within Pukaskwa itself and outside its boundaries, is based on discussions with park staff. Such information is not statistical and only estimates the likelihood of encountering other visitors.

The social setting map could be improved dramatically if more detailed data and information were available on visitation to, and use of, the Pukaskwa region.

Similarities between the social and physical setting maps are evident, especially along the Highway #17 corridor and the forest access road network that spreads out from it. Under social setting, *frontcountry service* opportunity classes, described by a circle with a 5 km radius, are centred on Wawa, White River, and Marathon. The highest concentrations of people in the region are found here. There are likely to be encounters with more than 30 people per day in this opportunity class. Once again, a *frontcountry modified* opportunity class, with its 3 km buffer on each side, parallels the Trans-Canada Highway (#17) corridor along the boundary of the region. Though encounters in such areas may be in excess of 30 people per day, they are brief in duration.

Frontcountry natural opportunity areas reflect the lower likelihood of meeting other people beyond frontcountry modified opportunity areas. This opportunity area designation is applied to the area around the park office and Hattie Cove, where encounters with other people may be between 10 and 30 per day.

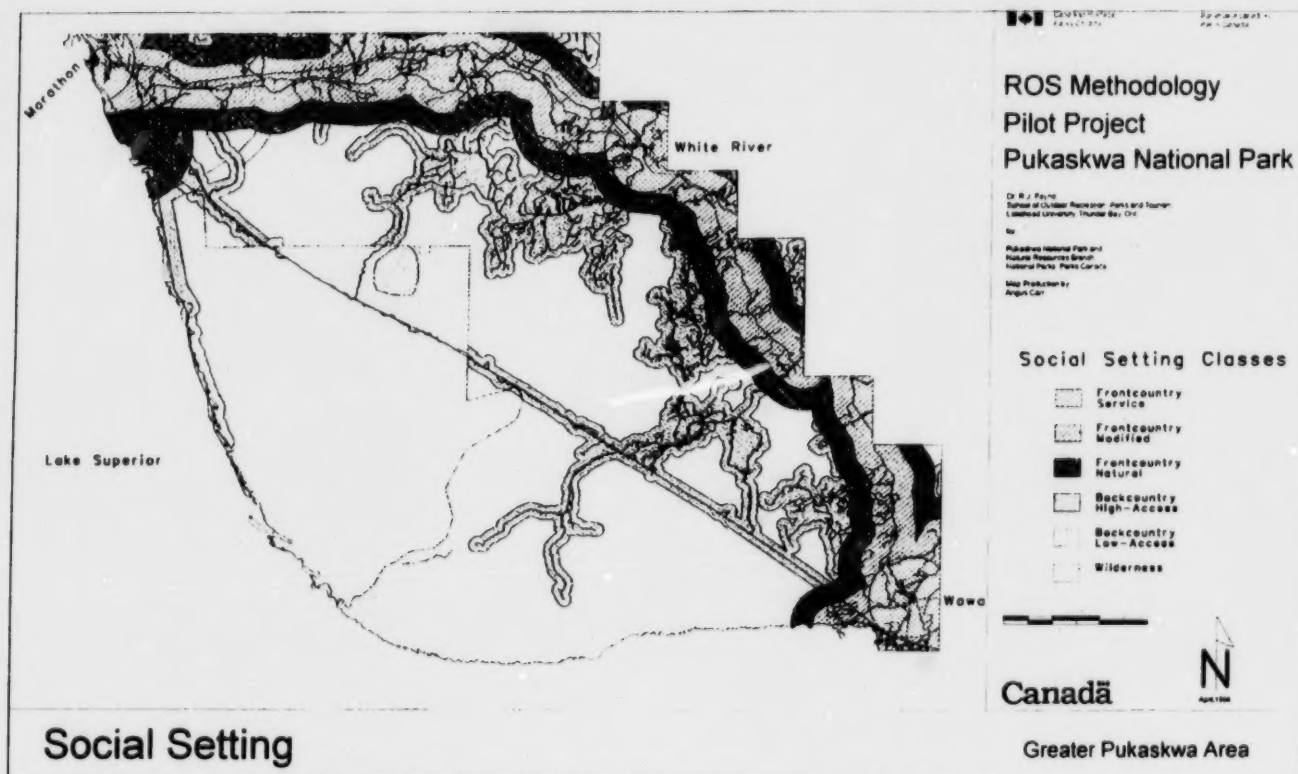
Backcountry opportunity areas are more extensive on the social setting map than on the physical setting map.

The likelihood of encountering other people in *backcountry high-access* opportunity areas is high, but the number of people encountered is low (between 1 and 2 parties per day). This opportunity area buffers less travelled backcountry areas from frontcountry areas. These areas describe opportunities that are 1 km on either side of forest access roads, the

hydro-electric transmission corridor, and the coastal hiking trail to Oiseaux Bay. Similarly, on the advice of park staff, Otter Bay and Simons Bay are placed into this opportunity class under social setting because both receive substantial, but undocumented boating traffic during the summer months. Physical barriers put in place by park staff where the corridor enters and exits the national park, and where a forest access road meets the northern park boundary limit access in these areas.

Backcountry low-access opportunity areas occupy only small areas of the Pukaskwa region. South of Oiseaux Bay, the designation along the coastal hiking trail represents the likelihood of meeting one other party every other day. The other area, near the northern boundary of the park, reflects use by anglers during the spring.

Finally, *wilderness* opportunity areas show large areas of the Pukaskwa region where encounters are very low.



Map 2: The Social Setting (Pukaskwa)

2.2.3 The Managerial Setting

Map 3 presents the managerial setting for the Pukaskwa region. The managerial setting recognizes the importance of management decisions and actions on the landscape.

Within Pukaskwa National Park, the managerial setting depends on the park's zoning. Zone II, wilderness, covers much of Pukaskwa National Park. Other national park zones cover areas too small to be shown on a map of this scale.

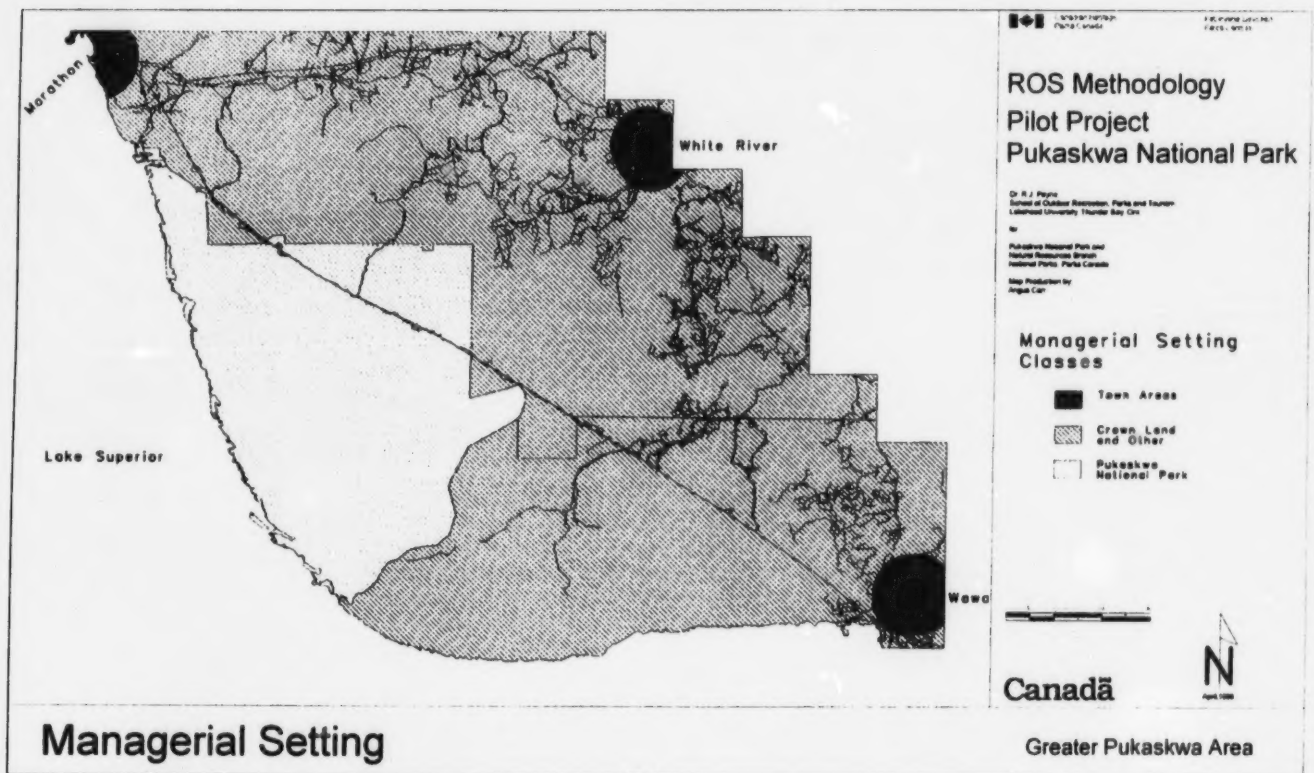
Outside national park lands, Crown land management is the responsibility of the Government of Ontario, and especially, the Ministry of Natural Resources (OMNR). In the areas to the north and east of the national park, the OMNR supervises two Forest Management Agreements with forest companies. The forest access roads near the boundaries of Pukaskwa National Park are subject to OMNR approval. It is expected that a primary forest access road will cross the hydro-electric transmission corridor and the Pukaskwa River in the near future, bringing road access to remote areas of the park. It is likely that the travel time by road from White River, on Highway #17, to the Pukaskwa River will be about 30 minutes.

The Ministry also manages seasonal moose hunting and recreational fishing, as well as other Crown land recreation activities such as snowmobiling.

Recent (1995) reductions in budgets and staffing in the OMNR have resulted in the delegation of some land management responsibilities to forest companies.

First Nations communities hold reserve lands along the Pic River adjacent to the Hattie Cove area, as well as at Mobert and Michipicoten. Aboriginal peoples from these reserves retain traditional hunting, fishing, and trapping rights throughout the Pukaskwa region.

Although they cannot be easily mapped, park management actions to limit visitation to particular areas are important components of the managerial setting. One such area is at the point where a forest access road meets the northern park boundary (where a gate to control vehicular access to the national park has been erected).



Map 3: The Managerial Setting (Pukaskwa)

2.2.4 ROS Opportunity Areas

The final ROS opportunity classes are shown in Map 4. These opportunity areas were determined by reconciling the differences between the managerial, physical, and social setting maps. In the Pukaskwa region, the physical setting, lead by the remoteness criterion, dominates the final ROS class determination. Roads strongly influence visitor opportunities even in the national park.

The areas of Wawa, White River, and Marathon remain in *frontcountry service* opportunity class. They offers visitors a substantial degree of landscape modification, high densities of people, and a variety of services.

The highway corridor (the Trans-Canada Highway/Highway #17) is classed as *frontcountry modified*, a reflection of influences of human modification and user densities.

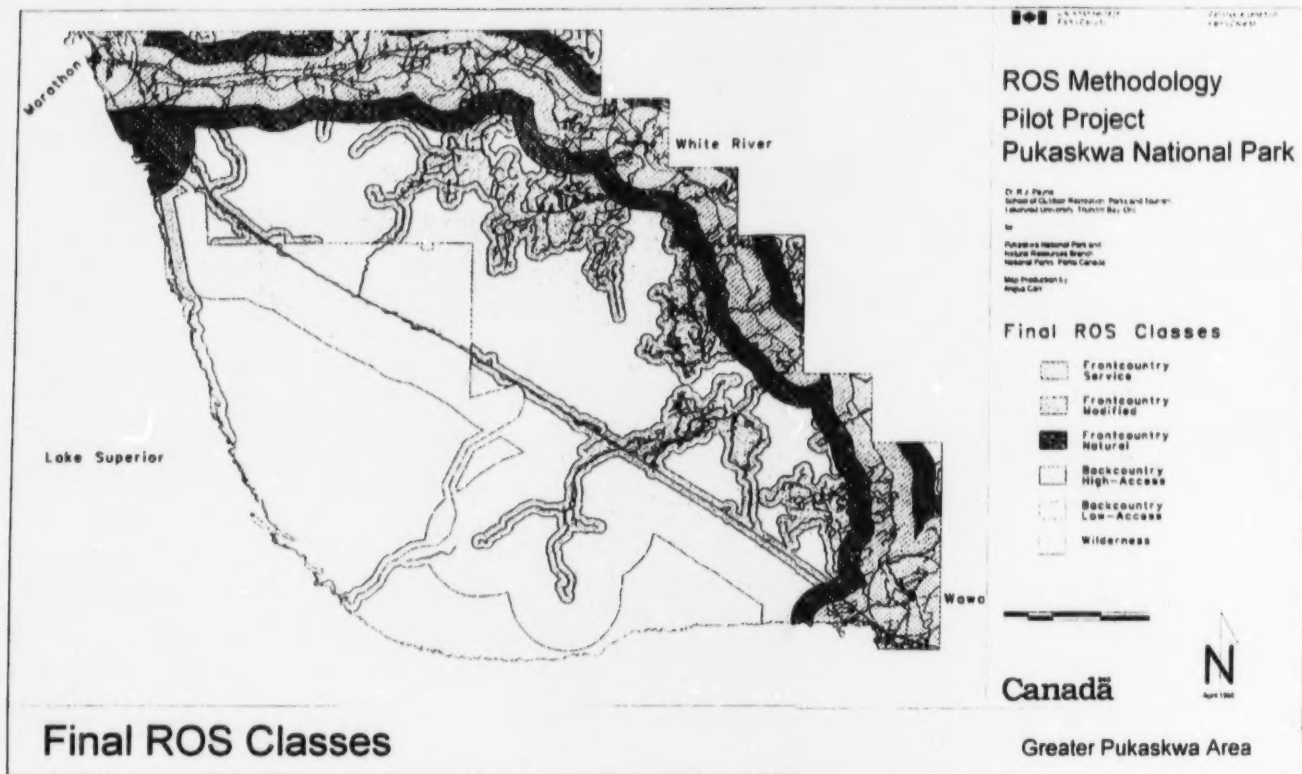
Frontcountry natural opportunity areas constitute gateways to the backcountry and include the areas of Pukaskwa National Park that are most visited by people, such as Hattie Cove and the upper coastal hiking trail. They are more remote, less modified by human activities, and less used by people than other frontcountry opportunity classes.

While frontcountry opportunity areas comprise a substantial area of the Pukaskwa region, they do not constitute a large portion of the national park.

Just as when the park was first established, backcountry opportunity areas in the Pukaskwa region constitute a large area.

Backcountry high-access opportunity areas parallel frontcountry natural areas. These areas offer visitors backcountry experiences that are less remote (and less risky) than opportunity areas toward the wilderness end of the spectrum. Outside the park, these opportunity areas are associated with forest access roads and the hydro-electric transmission corridor. Inside the park, the possibility of encountering other visitors on the portion of the coastal hiking between the White River Bridge and Oiseaux Bay is high and accounts for the area's backcountry high-access classification.

Backcountry low-access opportunity areas serve to separate true wilderness opportunity areas from those designated as backcountry high-access. This opportunity class continues to occupy large portions of the region, both within and outside the national park. The planned extension of forest access roads will erode this opportunity class in the next few years.



Map 4: ROS Opportunity Classes (Pukaskwa)

Wilderness opportunity areas comprise two large sections of the region, one of which is in Pukaskwa National Park. This area, the park's wilderness core, faces a reduction in size as roads bring modifications and people into formerly remote areas outside park boundaries.

2.3 Opportunity Assessment in the Yoho National Park Region

2.3.1 The Physical Setting

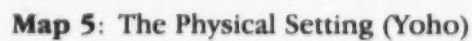
The physical setting of the Yoho region is presented in Map 5.⁵ Three elements combine to produce the physical setting: remoteness, evidence of humans, and size. When applied in the ROS framework, these elements form the basis for classifying the Yoho Region landscape into opportunity areas.

Existing (digitized) data and information provide the primary basis for map development. ROS criteria concerning sizes of opportunity areas were generally followed.

The concentration of human modifications of the natural environment (roads, bridges, railways, buildings, parking lots, and noise) at Field puts an area with a 5 km radius of those settlements into a *frontcountry service* opportunity class. The more linear modifications associated with the presence of, and the sounds from, the highway and rail line are responsible for a 2 km *frontcountry modified* designation (on each side) along the Kicking Horse River, through the centre of the national park. The frontcountry modified designation is also applied to the lower Yoho valley and the Lake O'Hara access in the park and to the Blaeberry Road and the Icefields Parkway outside Yoho's boundaries. Finally, a 1 km buffer, designated as *frontcountry natural*, where human modification is minor, but where sights and sounds of human activity are still present, separates frontcountry from backcountry.

All frontcountry opportunity areas under the physical setting mapping exhibit evidence of human activity, through modifications of the natural landscape, through the sights and sounds of such modification, or both. The subdivisions of frontcountry represent an increased degree of remoteness from frontcountry service through to frontcountry natural.

⁵ The classification of the Yoho region according to physical setting criteria bears a strong resemblance to the results of a fragmentation analysis being completed at Headquarters.



Backcountry opportunity areas share characteristics of minimal human modification, relative remoteness, and large size.

A *backcountry high-access* opportunity class is bordered by a 1 km buffer around roads that can be used by motor vehicles. Therefore, the former fire roads along the Ottertail and Amiskwi rivers fall into this class. Human modifications to the natural environment are minimal, but the presence of these roads makes backcountry high-access areas less remote than other backcountry areas. This opportunity class also acts as a buffer to frontcountry areas, with remoteness as the key criterion.

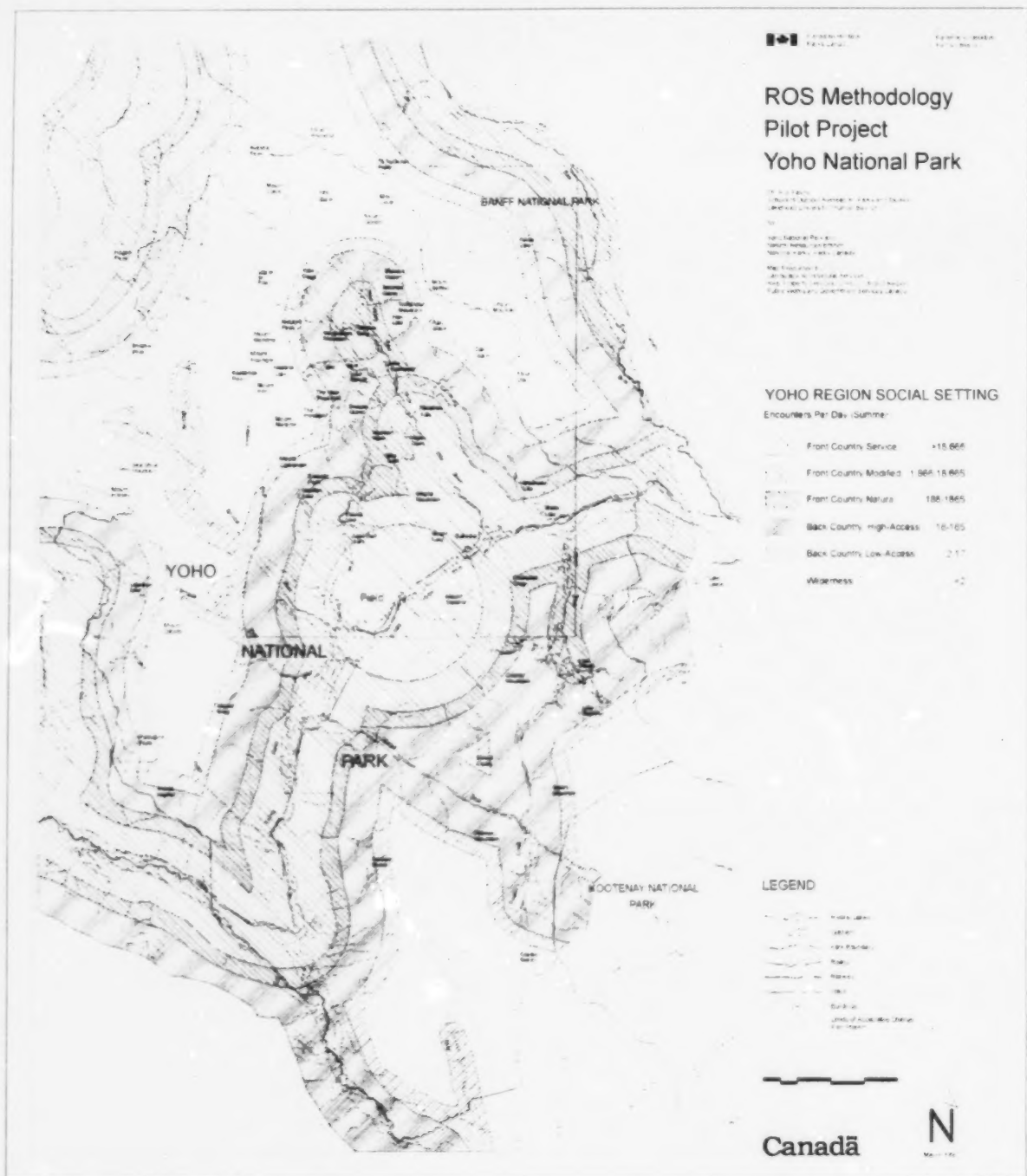
A second backcountry opportunity designation, *backcountry low-access*, surrounds all backcountry high-access areas (with a 2 km buffer on each side). These areas, not immediately accessible by motor-vehicle, are more remote than backcountry high-access areas, offering settings and experiences closer to the wilderness end of the spectrum.

Finally, areas designated as *wilderness* opportunity class, account for the remainder of the Yoho region. The largest two of these areas are high mountain areas extending into Banff National Park in the north and into Kootenay National Park in the southeast. These areas are the least modified by human activity and the most remote. They are also larger than the 5,000 ha minimum necessary for inclusion in the backcountry opportunity class.

2.3.2 The Social Setting

Map 6 presents the social setting mapping for the Yoho Region. The opportunity classes under social setting reflect the likelihood of meeting other people while pursuing recreation opportunities.

Information for the daily encounter norm ranges in Map 6 is derived from the Summer Human Use map in the *Atlas of the Central Rockies Ecosystem* (White et al., 1995). The reliability and accuracy of that information varies. Information on vehicular travel on main roads and highways is based on traffic counts; reliability is high but its accuracy might be affected by factors such as weather. Similarly, information reported for trails was collected from permits and is generally reliable. Such information, however, may vary due to other factors. The resulting encounter ranges, especially in frontcountry opportunity classes, can only be considered as approximations.



Map 6: The Social Setting (Yoho)

The social setting map could be improved dramatically if more detailed data and information were available on visitation to the Yoho Region. Neither data nor information of that sort is currently available.⁶

Similarities between the social and physical setting maps are evident. Under social setting, a *frontcountry service* opportunity class, described by a circle with a 5 km radius, is centred on Field. The highest concentrations of people are found here. A *frontcountry modified* opportunity class, with its 2 km buffer on each side, parallels the Trans-Canada/CPR rail corridor through the Kicking Horse River valley. That opportunity area designation is also applied to the lower Yoho valley, to the Icefields Parkway, and to portions of the Blaeberry Road west of Yoho National Park.

Frontcountry natural opportunity areas reflect the lower likelihood of meeting other people beyond frontcountry modified opportunity areas. These opportunity areas also reflect more difficult access, by the restrictions placed on visitation to Lake O'Hara and by trail design in the upper Yoho valley.

Backcountry opportunity areas are more extensive on the social setting map than on the physical setting map.

In *backcountry high-access* opportunity areas the likelihood of encountering others is relatively high, but the number of people encountered is relatively low. This opportunity area buffers less travelled backcountry from frontcountry areas. The exception to the rule is the large backcountry high-access opportunity area south of Field, a reflection of the popularity of the trail systems there with backcountry hikers.

Backcountry low-access opportunity areas primarily function as buffers for wilderness areas, with the exception of areas along the Ice and Amiskwi rivers where physical barriers (put in place by park staff) keep encounters low.

Finally, *wilderness* opportunity areas depict those areas of the Yoho Region in which encounters are low. Similar to the physical setting map, the influences of the two adjacent national parks and high elevations are apparent here.

⁶ Derek Petersen indicates that during the summer of 1996 trail counters were applied to high-use trails in the national park, providing an additional and reliable source of data.

2.3.3 *The Managerial Setting*

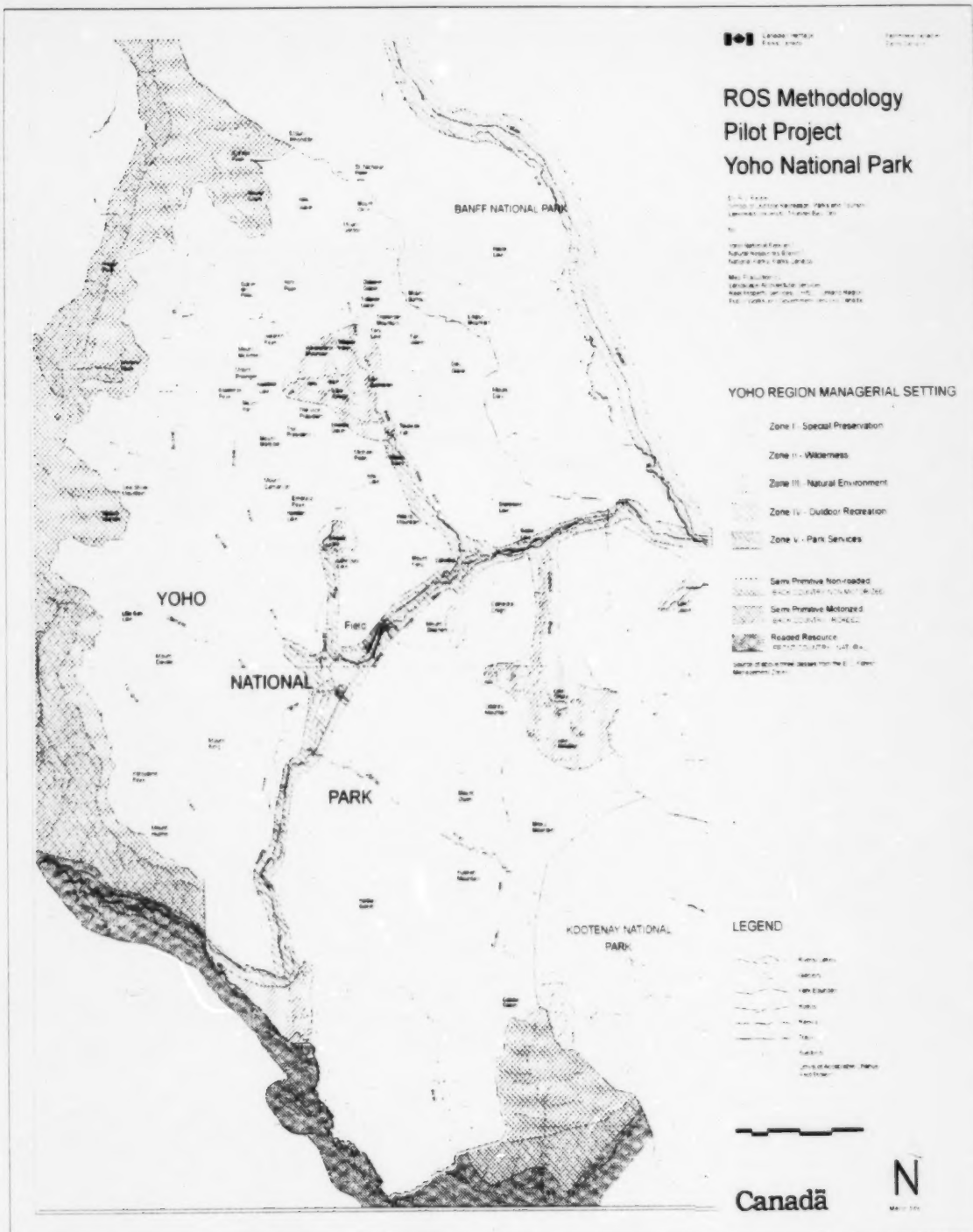
Map 7 presents the managerial setting for the Yoho region. The managerial setting recognizes the importance of management decisions and actions on the landscape.

Within Yoho, Banff, and Kootenay national parks, the managerial setting draws on zoning in the parks. Zone II, wilderness, covers a substantial component of the Region, including much of Yoho National Park. Zone III, natural environment, encompasses a much smaller area, with nodes in the upper Yoho valley at Emerald Lake, the O'Hara Lake area, Lake Louise, and Wapta Falls. A linear zone IV, outdoor recreation, encompasses the Trans-Canada Highway, the Icefields Parkway, and roads leading to Emerald Lake and the Yoho valley. Zone I, special preservation, delimits the Burgess Shale site and the upper Ice River valley, an ecologically sensitive area that is part of the home range of a population of grizzly bears in Kootenay National Park.

Outside national park lands, the B.C. Ministry of Forests has applied a ROS classification to lands under its jurisdiction, resulting in "semi-primitive non-motorized" and "semi-primitive motorized" opportunity areas along the Blaeberry and Moose Creek/Beaverfoot River valleys, and "roaded resource" opportunity areas along the lower Blaeberry and Kicking Horse River valleys.

Although they cannot be easily mapped, park management actions to limit visitation to particular areas are important components of the managerial setting. One such area, which is clearly shown in Map 7, is the Lake O'Hara area and the road providing access to it. Access to Lake O'Hara by private automobile is no longer possible; visitors must reserve space on a limited number of bus trips each day or hike the 13 kilometres from the parking lots adjacent to the Trans-Canada Highway.

Seasonal restrictions (not shown on Map 7) placed on the trails that link Lake O'Hara with the Ottertall Trail and those into the Lake Louise area, are also important, as they protect visitors and grizzly bears from each other.



Map 7: The Managerial Setting (Yoho)

2.3.4 ROS Opportunity Areas

The final ROS opportunity classes are shown in Map 8. These opportunity areas were determined by reconciling the differences between the managerial, physical, and social setting maps. In the Yoho Region, the physical setting, determined largely by the evidence of humans, combines with the social setting to overcome Parks Canada's attempts to manage for wilderness opportunities in Yoho National Park.

The Field area remains in *frontcountry service* opportunity class. It offers visitors a substantial amount of landscape modification, and relatively high densities of people, and park and other services.

The highway corridors (the Trans-Canada Highway and the Icefields Parkway), as well as parts of the Blaeberry Road are classed as *frontcountry modified*, a reflection of influences of human modification and user densities.

Frontcountry natural opportunity areas constitute gateways to backcountry areas. They are more remote, less modified by human activities, and less used by people.

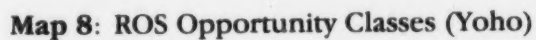
Frontcountry opportunity areas comprise an area that is approximately one-third of Yoho National Park. Based on the density of users, however, these opportunity areas constitute the Yoho experience for most visitors.

Backcountry opportunity areas in the Yoho Region comprise higher mountains.

Backcountry high-access opportunity areas parallel frontcountry natural areas. These areas offer visitors backcountry experiences that are less remote (and less dangerous) than opportunity areas at the wilderness end of the spectrum. South of Field, along the Ottertail River and throughout the trail system into the Lake O'Hara area, the density of users accounts for the backcountry high-access designation.

Backcountry low-access opportunity areas serve to separate wilderness opportunity areas from backcountry areas. The exception to this rule occurs along the middle to upper reaches of the Amiskwi River, where Parks Canada's trail restrictions keep user densities low and promote more wilderness-oriented experiences.

Wilderness opportunity areas comprise two large sections of the Region, reflecting on the north and northwest, the presence of Banff National Park and on the southeast, the presence of Kootenay National Park. For the Yoho Region, these wilderness opportunity areas constitute areas that are least modified, most remote, and least visited.



3 Discussion and Implications

3.1 General

The application of the ROS to assess visitor opportunities in the Pukaskwa and Yoho national parks was completed as a demonstration project. The intent was to address the specific limitations of VAMP, an activity-based approach, in dealing with visitor opportunity management in national parks. It is important to understand that the ROS framework is not meant to replace Parks Canada's existing Visitor Activity Management Process. Rather, by focusing on visitor opportunities in their particular ROS conceptualization, the intent is to complement existing processes and support more integrated planning and management activities in national parks.

The ROS framework produces an assessment of the supply of visitor opportunities that gives managers a distinctive regional or areal view. This view is a significant product: as most national parks are large and wilderness-oriented, many people come to national parks because they expect wilderness or backcountry opportunities. A framework oriented to site-level planning and management would not give managers the information appropriate to regional or areal management.

In addition to illustrating that visitor opportunities can be assessed in a systematic manner and from a well-supported theoretical point of view, the application of the ROS framework to the two national parks demonstrates several other benefits for national park managers.

3.2 Ecosystem Management

In its handling of the physical setting, the ROS framework implicitly focuses on ecological integrity, a key goal of national park management in Canada. One dimension of ecological integrity is "naturalness", a relative term that can be defined as the degree of human modification of a landscape (Payne and Lee Kam, 1994). Naturalness is a quality of the natural environment (the setting for visitor activities) in national parks that many visitors are aware of, understand, and appreciate.

Connecting the facts of visitation with management decision making for national parks highlights the conflicts between the goals of protection and use. If ecosystem management is the means to bring ecological integrity into national park decision making, then the ROS framework is an excellent way to bring visitation issues together with issues of ecological science in a way that does justice to both.

3.3 A Spatial Dimension

The accompanying maps show that the ROS framework can be expressed in spatial terms. Each opportunity area, determined through the ROS process, occupies a specific territory within the national park. The spatial capability inherent in the ROS framework addresses one of the two limitations of activity-based management described earlier.

The ROS framework is easily integrated, as a specific layer of information, within the digitized databases now common in Canadian national parks. These databases enable park managers to maintain information about opportunity areas in the same way they now maintain information on relief, hydrological, and ecological areas. The convergence of the physical setting component of the ROS framework with definitions of ecological integrity notwithstanding, the fact that opportunity areas determined by the ROS can be spatially expressed through GIS technologies helps to integrate natural science and social science information.

3.4 Visitor Data and Information

Opportunity areas describe settings with certain qualities that are capable of supporting a specific range of visitor experiences. They are a product of the ROS framework that works as a structure for the collection and indexing of data and information about visitors, and their activities and experiences. There is no systematic collection of such information in national parks.

Structured by opportunity area, information about visitors would help park managers examine how (and whether) opportunities are used by visitors, and to manage conflicts between protection and recreational use, and conflicts among visitors.

3.5 The ROS Pilot, the "Backcountry Opportunity Spectrum" and Zoning

As part of the run-up to management plan review at Pukaskwa National Park, staff developed a "Backcountry Opportunity Spectrum" that was based on the ROS framework. Yoho National Park was the focus of a partial ROS application for backcountry areas as part of the Four Mountain Parks planning exercise. The resulting "Backcountry Opportunity Spectrums" were used as the basis for park zoning in the recently approved *Pukaskwa National Park Management Plan* (1996) and the most recent *Yoho National Park Management Plan* (1988).

Both Backcountry Opportunity Spectrums are partial applications of the ROS for several reasons:

- the applications only considered existing backcountry zones, as defined by Parks Canada;
- frontcountry areas were not considered; and
- areas outside national park boundaries were not considered.

These limitations are significant, primarily because they eliminate the ability of the ROS to account for modifications to the natural environment (by determining the physical setting) and for visitor densities (by determining the social setting). Therefore, the Backcountry Opportunity Spectrum is little more than an expression, by Parks Canada staff, of how the wilderness areas can be subdivided and managed. As the physical and social setting analyses indicated, however, larger areas of the park are affected by modifications to the natural environment (inside and outside park boundaries) and by the ongoing presence of large numbers of people. Such areas would be more correctly termed "frontcountry" from a visitor opportunity assessment point of view.

The demonstration illustrates how the ROS functions to assess visitor opportunities.

3.6 Infrastructure Decision Making

The visitor opportunity areas produced through the ROS framework offer a context for decisions about the provision of park infrastructure, such as visitor facilities, roads, and trails. Recent initiatives at Parks Canada involving staff from Real Property Services, and Appropriate Activity Assessment and Risk Management have revealed some confusion concerning what level of infrastructure is appropriate in national parks. The ROS framework is sensitive to modifications of the natural landscape. Opportunity areas may provide a useful context in which to make decisions concerning infrastructure developments.

3.7 Examining National Park Scenarios

The ROS framework has the ability to simulate the results of management actions. Park managers may consider certain actions to change settings (e.g., a road closure) or density of visitors (e.g., road access into the Pukaskwa River). Changing either the physical or social setting can change opportunities. National park managers may knowingly suggest changes to the physical or social settings, and then examine the shifts that occur in the resulting opportunity structure.

Two examples illustrate a shift in opportunity:

Example 1: At Pukaskwa, attempts to resolve issues about the appropriateness of management support of visitor activities along the coastal hiking trail between Hattie Cove and the White River bridge have foundered owing to the fact that, under current park zoning, most of the trail, as well as the bridge, is zoned as wilderness. The ROS application in Pukaskwa classifies this area as a frontcountry natural visitor opportunity and helps to justify management efforts to support several forms of hiking.

Example 2: In restricting vehicular traffic into Lake O'Hara in Yoho National Park, park managers have successfully shifted opportunity classifications from frontcountry modified to frontcountry natural. As a result, they have preserved visitor experiences that are more nature-oriented than people-oriented, and settings that are more natural than human-dominated.

Both examples show that the ROS provides a comprehensive context in which to determine visitor opportunity areas in support of management decision making.

3.8 The National Parks and Their Regions

It is now common for commentators on national park matters to advocate that a national park be managed within its regional context. The application of the ROS framework in the Pukaskwa and Yoho national park regions demonstrates that this advice has merit.

In the case of Pukaskwa National Park, it is also clear that the management strategies of the Ontario Ministry of Natural Resources outside Pukaskwa National Park boundaries are significant factors in influencing visitor opportunities within Pukaskwa's boundaries. The questionable ability of the OMNR to manage land effectively requires immediate consultations with that agency and the forest companies to which it has delegated management authority. For Pukaskwa National Park managers, visitor opportunities, as well as ecological integrity, are at stake.

In the case of Yoho National Park, managing within the regional context is a double-edged sword. It is apparent that the presence of Banff National Park to the north and northeast, and Kootenay National Park to the southeast, is a significant factor in determining visitor opportunities within Yoho. Management actions in those parks will continue to be felt in Yoho National Park. Therefore, the Four Mountain Park planning initiative and the more recent attempt to coordinate backcountry management efforts among the four parks can only be commended.

It is also clear, however, that the management strategies of the B.C. Ministry of Forests outside Yoho National Park boundaries affect visitor opportunities within Yoho's boundaries. The need to consult with that agency and manage in the broad regional context is as important to visitor opportunities as it is to more overt ecological concerns within Yoho National Park.

4 Conclusions

This report set out to apply the ROS framework to Pukaskwa and Yoho national parks to demonstrate that the framework offers park managers a theory-based tool to assess visitor opportunities.

On a conceptual level, the ROS framework incorporates four unique features in park planning and management:

- links settings and activities;
- embodies a setting-based approach to management that integrates visitor management with "traditional" natural resource management processes;
- works at the regional or area scale; and
- incorporates some of the ideas on which ecosystem management is based.

On this conceptual level, the ROS framework helps to manage national parks because it succeeds in integrating visitor management with park management planning.

Implementing the ROS framework in a national park context depends on the availability of specific information. In both case studies, a large portion of the information necessary to develop the physical and managerial setting maps was readily available. Much of the information concerning human modifications in and around Pukaskwa National park has been digitized by the park and by the Ontario government. Though some technical problems exist with digitized information about Yoho National Park, it is readily available. Digital information from B.C. Crown lands is available, and includes ROS-based material used to manage recreation and tourism. Acquiring the information necessary for development of the managerial setting map in the Pukaskwa region required more work, involving discussions with Pukaskwa National Park staff, as well as with members of the Ontario Ministry of Natural Resources. Acquiring information and data to build the social setting map was problematic. In the Pukaskwa pilot project, the decision to use backcountry permits as data for the social setting was made reluctantly. The use of such data reflects the reality, common to all Canadian national parks, that information about visitors is neither statistical nor geocoded. The small amount of reliable and accurate data needed for the social setting map inhibits the effectiveness of the ROS framework in a national park context.

The results of the pilot projects provide managers with a set of opportunity areas, ranging from frontcountry to wilderness. These opportunity areas are relevant for the summer season, when the parks are fully operational and visitation is at its peak. Opportunities for visitors in other seasons would be affected by reduced visitation, by management actions and by influences from outside the park's boundaries (e.g., the annual moose hunting season in Pukaskwa from late September to the end of November). Information about such seasonal variation should be included in a complete visitor opportunity assessment.

The opportunity areas shown on Maps 4 and 8 must be re-aligned to reflect the topographies of the two national parks and their regions. In the Yoho case study, the influence of topography would be dramatic, especially in the physical setting map. In these demonstrations, no attempt has been made to use ridge lines, viewsheds, or soundsheds as refinements for opportunity area delimitation. The sights and sounds of human activity, however, might disappear on the other side of ridges, effectively changing the nature of visitor opportunities there.

Determining visitor opportunities for a national park enables management to use opportunity areas as key factors in further national park decision making. Facility, infrastructure, and service decisions can be made with awareness of the effects on visitor opportunities; decisions made by other agencies or partners outside national park boundaries can be examined for their effects on visitor opportunities with the national park.

The ROS framework gives park managers a tool which could help to achieve general, as well as specific, national park goals. The next step is to combine the ROS opportunity class map with other forms of (mapped) data to demonstrate how natural and social science data, information, and knowledge can be integrated to support decision making in Canadian national parks.

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